OBSERVATIONS ON *TILAPIA MOSSAMBICA* PETERS IN MADRAS

BY

P. I. Chacko & B. Krishnamurthi

(*Freshwater Fisheries Biological Station, Madras*)

(*With six text figures*)

Introduction

The Cichlid fish, *Tilapia mossambica* Peters, is of economic importance as a source of protein for the population of Africa (Graham, 1929; Worthington, 1929; Wilbaux, 1946 & 1947; Hey, 1947; Bont, 1948; Sklower, 1951; Lowe, 1952). Owing to its great cultural value this fish has been introduced and cultured in several Asian countries such as Ceylon (De Zylva, 1952 & 1953), Indonesia (Hofstede and Ardiwinata, 1950; Hofstede and Botke, 1950; Vaas and Hofstede, 1952), Malaya (Burdon, 1950; Hickling, 1950) and Taiwan (Chen, 1953), from where favourable reports are made. The fish was first introduced into Madras from Ceylon on 8th September 1952, and the preliminary observations gave encouraging results (Devadas and Chacko, 1953 *a* & *b*). In this communication the salient features of further investigations carried out by us at the Freshwater Fisheries Biological Station, Madras, are recorded, in view of the many enquiries received from fisheries officers and fish farmers throughout India.

Food and Feeding Habits

The fish has been found feeding mostly on the following algae:

Cyanophyceae: *Anabaena*, *Merismopedia*, *Microcystis*, *Oscillatoria* and *Tetrapedia*.

Chlorophyceae: *Actinastrum*, *Ankistrodesmus*, *Chlamydomonas*, *Chlorella*, *Closterium*, *Coelastrum*, *Cosmarium*, *Eudorina*, *Gonium*, *Mougeotia*, *Netrium*, *Pandorina*, *Pediastrum*, *Planktonema*, *Rhizoclonium*, *Scenedesmus*, *Selenastrum*, *Spirogyra* and *Staurastrum*.

Bacillariophyceae: *Amphora*, *Cyclotella*, *Fragilaria*, *Gomphonema*, *Gyrosigma*, *Navicula*, *Nitzschia*, *Pinnularia*, *Pleurosigma*, *Synedra* and *Tabellaria*.

Zooplanktonic organisms such as protozoans (*Euglena*, *Peridinum*, *Phacus* and *Volvox*), rotifers (*Anuraea* and *Brachionus*), daphnids (*Bosmina*, *Ceriodaphnia* and *Moina*), ostracods (*Cypridopsis*) and copepods (*Mesocyclops* and *Neodiaptomus*), and leaves of hydrophytes like *Hydrilla verticillata* and *Chara zeylanica* are also consumed in smaller proportions. Sand grains are frequent in the guts, indicating browsing at the bottom. Under aquarium conditions the fish is found to be omnivorous, feeding on plant matter, mosquito larvae, corixid bugs, shrimps (*Caridina nilotica*), cooked rice, rice bran, oil-cake,

and strands of boiled meat. When starved, small carp fry introduced into the aquarium are consumed to a certain extent. *Barbus stigma*, *Brachydanio rerio*, *Gambusia affinis*, *Oryzias melastigma* and similar smaller species of fish when introduced into the aquarium are found to be attacked only rarely.

Growth

The fish attains a length of 220 mm. (9 inches) and a weight of 4 to 5 oz. in 8 months. The growth thereafter is slow, only 12 inches and 8 oz. being reached at the end of 16 months.

Association with other fishes

In the ponds of the Chetpat fish farm, Ippur fish farm, Yellamanchili demonstration farm and Chingleput fort moat farm, Tilapia is growing well in association with *Catla catla*, *Cirrhina mrigala*, *C. cirrhosa*, *C. reba*, *Labeo fimbriatus*, *L. rohita*, *Barbus sarana*, *Barbus carnaticus*, *Cyprinus carpio*, *Osphronemus goramy*, *Chanos chanos* and *Etroplus suratensis*. Carp fingerlings have been stocked with and without Tilapia in ponds of identical conditions; and observations on their growth did not show any difference.

Maturity and Breeding

Tilapia attains maturity in Madras when about 90 to 100 mm. in size and 3 months old. The left ovary is slightly longer than the right one; and they contain 220 and 180 ova respectively. The mature egg is oblong and measures 20 to 22 mm. along its long axis. The mother has been noted to carry about 350 fertilised eggs in its mouth till the hatchlings attain a size of 9 to 10 mm. Breeders can be distinguished by the rosy tinge of their fins. Spawning is repeated at intervals of 8 to 10 weeks.

Development

The fertilised egg measures about 25 mm. and has little pervitelline space. The yolk is yellowish-cream in colour and is minutely segmented. There are no oil globules. The eggs are reared successfully in aquaria for following embryonic development. By the end of the first day the eyes, auditory vesicle and few stellate chromatophores appear (fig. 1). At 36 hours after fertilisation the embryo is well

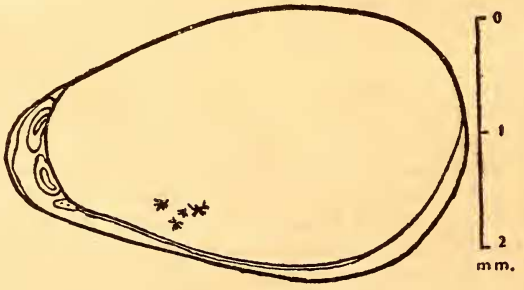

Fig. 1.—Embryo at end of first day of fertilisation.

defined with 11-14 myotomes. At the 48th hour, more chromatophores appear; and the embryo shows more myotomes, heart and blood vessels (fig. 2). On the third day the embryo almost completely

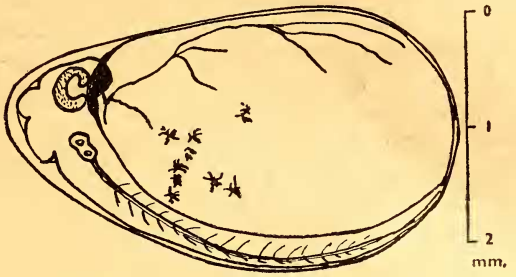

FIG. 2.—Embryo at the end of second day.

encircles the yolk-mass, and shows wriggling movements within the membrane. At the end of the fourth day hatching commences. The

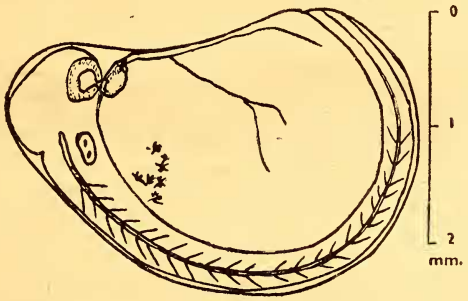

FIG. 3.—Embryo at the end of fourth day.

hatchling is delicate and transparent, and measures 3.5 mm. in length and 0.35 mm. in width at the anal region. The yolk sac is 1.72 mm. in diameter. The eyes are not closed though pigmented bluish (fig. 4). On the second day after hatching the larva measures

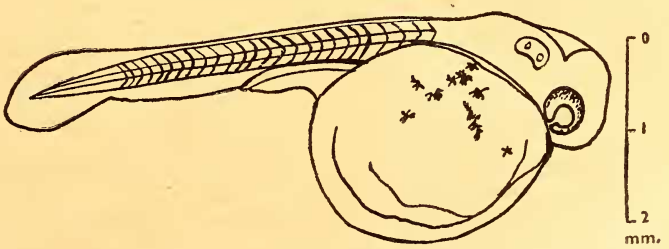

FIG. 4.—Hatchling.

5 mm. in length, and develops a yellowish tinge. Twenty-six myotomes are discernible. The eyes are fully developed but the mouth is not formed yet. The gills and pectoral fin buds appear. On the third day the larva is 5.5 mm. in length and shows occasional swimming

movements at the bottom of the aquarium. Mouth is formed, and the caudal fin demarcated. Thirty myotomes are clearly seen. More chromatophores appear over the body, particularly on the head (fig. 5). On the fourth day the larva continues to remain at the bottom

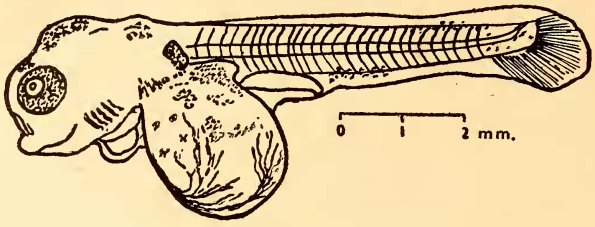

Fig. 5.—Three days old larva.

with occasional brief risings to the surface. On the fifth day, the yolk sac is almost absorbed, and the larva swims at the surface. The dorsal and anal fins are differentiated, and 7-8 rays can be counted in the former. Chromatophores get distributed thickly in the head, nape and pectoral region (fig. 6). On the sixth day, the

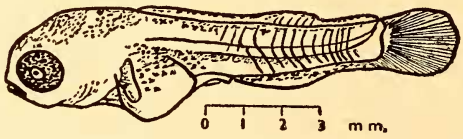

Fig. 6.—Six days old larva.

larva commences to feed mainly on diatoms and on a few daphnids and copepods. On the seventh day, the larva is 7 mm. in length; and actively feeds on planktonic organisms. Twentyfive and twelve rays can be counted on the dorsal and anal fins, though the embryonic fin fold is still present. Pigmentation is spread almost all over the body. On the ninth day, the larva measures 8.5 mm., with its ventral portion yellowish-blue and the opercles golden in colour. The ventral fins are also formed. On the tenth day the chromatophores tend to crowd on the dorsal half of the body in the form of vertical bands. It is at this stage that the young ones are liberated by the mother from its mouth.

Suitability for culture in South India

Non-cannibalistic habit, rapid growth and propagation, parental care, harmless association with indigenous species, adaptability to different types of fresh and brackish waters, capacity to withstand handling and transport, and algicidal and mosquitocidal propensities make this exotic fish ideal for culture in South Indian waters many of which dry up in the summer. The seasonal waters can be stocked with Tilapia for raising a good fish crop within the short duration of water supply. It is also suited for the innumerable temple and village tanks, which are usually dirty and overgrown with algae. Its medium size and good flavour should make it popular with the rural

population, especially as it can be purchased at a lesser cost than the large sized carps. It is also tasty and without small bones embedded in its flesh. It is neither possible nor practical to collect and transport all the required number of carp fry and fingerlings from the few rivers (the carp fisheries of which are not great) for stocking rural waters, which are not easily accessible for lack of means of communication. The majority of the estuaries and backwaters do not contain good fisheries excepting that of mullets. Introduction of Tilapia, a perennial breeder, into these waters will not only enrich their fisheries but also ameliorate the economic condition of the coastal fisherfolk, particularly during the season when there is no sea fishing. Thus Tilapia has great potentialities in South India and also in other parts of India.

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